

WRITTEN OPINION OF THE  
INTERNATIONAL SEARCHING AUTHORITY  
(SUPPLEMENTAL SHEET)

International  
Application No.  
PCT/EP2004/052755

**Re Point V**

**Reasoned statement with regard to novelty, inventive step or industrial applicability;  
citations and explanations supporting such statement**

Reference is made to the following documents:

- D1: PATENT ABSTRACTS OF JAPAN vol. 1996, No. 12, 26<sup>th</sup> December 1996 (1996-12-26) -& JP 08 213163 A (MATSUSHITA ELECTRIC CO LTD), 20<sup>th</sup> August 1996 (1996-08-20)
- D2: US-B1-6 528 770 (AKEL DOMINIQUE ET AL) 4<sup>th</sup> March 2003 (2003-03-04)

**2 Novelty**

**2.1 Claim 1**

The present application does not meet the requirements of Article 33(1) PCT because the subject matter of claim 1 is not new in the sense of Article 33(2)PCT and is thus not inventive.

Using the wording of claim 1 as far as possible, document D1 discloses the following; the references in parentheses relate to document D1:

A method for operating a frequency converter circuit (Fig. 1; paragraph 12: frequency converters 3a and 3b) comprising at least two outputs (Fig. 1: outputs to which the induction coils 4a and 4b are attached) that are respectively connected to a load, especially an induction coil (Fig. 1: induction coils 4a and 4b), wherein a first output is operated at a first switching frequency and a second output is simultaneously operated at a second switching frequency that is different from the first (abstract: "oscillation frequency difference"; in conjunction with paragraphs 18-25: in the given example the two frequency converters 3a or 3b initially have the different frequencies 25 kHz or 33 kHz so that a frequency difference of 8 kHz is obtained which is to be reduced as a result of noise (abstract: "interference sound") to

below 1 kHz (abstract: "within 1 kHz"); "within 1 kHz" means that after suppression of the noise frequency deviations, i.e. different switching frequencies are permissible as long as they lie below 1 kHz) in such a way that noise having a frequency generated by the superposition of the first switching frequency and the second switching frequency is produced (abstract: "sound of interference due to a difference among oscillation frequencies"),

wherein the converter circuit is operated in such a way that the frequency of the noise is lower than a first cut-off frequency and/or higher than a second cut-off frequency (abstract: "lower an interference sound by eliminating the sound of interference" indicates that the noise must be suppressed below a cut-off frequency; this is achieved if the frequency different "oscillation frequency difference" of the frequencies of the two frequency converters 3a and 3b lies below 1 kHz "within 1 kHz").

In addition, claim 1 is also not new or inventive compared with document D2.

It also follows from the abstract and Fig. 3 in conjunction with column 2, lines 10-15 and column 9, lines 23-29 and claim 1 that the arrangement shown in Fig. 3 which has two frequency converters can be controlled in such a way that the outputs designated as F1 and F2 can be operated separately from their respectively allocated frequency converter and then, in order to avoid "beat frequencies", i.e. noise, are operated either at the same switching frequency ("same frequency") or at frequency multiples ("multiples of one frequency") as switching frequency. The avoidance of noise is equivalent to the fact that the frequency of the noise has to lie below or above a cut-off frequency of the hearing since the human ear is known not to perceive anything below or above certain frequencies.

## **2.2 Claim 2**

The dependent claim 2 contains no features which, in combination with the features of any claim to which it relates, satisfy the requirements of the PCT with regard to novelty or inventive step. In addition to the substantiation given for claim 1, the following can be deduced from document D1:

The abstract and paragraph 23 state that the lower of the two switching frequencies of the two frequency converters 3a and 3b ("low frequency") is increased until the difference of the switching frequencies lies below 1 kHz.

The additional features of claim 2 are also not new or inventive compared with D2 since the use of frequency multiples (see D2: abstract; Fig. 3 in conjunction with column 2, lines 10-15 and column 9, lines 23-29 and claim 1) and therefore different frequencies which differ by a multiple should prevent noise. The avoidance of noise is however equivalent to the fact that the frequency of the noise has to lie below or above a cut-off frequency of the hearing since the human ear is known not to perceive anything below or above certain frequencies.

### **2.3 Claim 3**

The dependent claim 3 contains no features which, in combination with the features of any claim to which it relates, satisfy the requirements of the PCT with regard to novelty or inventive step.

Thus, it can be deduced from D1, paragraphs 19 and 23 that a PWM regulation (paragraph 19: "pulse width control"; paragraph 23: "duty control") is provided.

It is further deduced from D2, column 1, line 65 to column 2, line 2 in conjunction with Fig. 3 and column 9, lines 23-29 that the power can be regulated by the switching frequency.

## **3. Inventive step**

The claims assessed hereinafter on the basis of the prior art presently available are new.

### **3.1 Claim 4**

Claim 4 does not satisfy the requirements of Article 33 (1) PCT because its subject matter does not appear to be based on an inventive step in the sense of Article 33(3).

It should be known from general knowledge that the audibility threshold (also known as the stimulus threshold) is that sound pressure or sound pressure level of the lower audibility limit of the auditory space at which the human hearing can still perceive sounds or noises. Since it is known that the curve of the audibility threshold is strongly frequency-dependent, it seems obvious that the person skilled in the art will select the cut-off frequencies  $g_1$  and  $g_2$  depending on the sound pressure level, i.e., noise level, and in such a way that these frequencies lie below or above the audible range.

### **3.4 Claim 5**

Claim 5 specifies that the cut-off frequencies are determined by means of the total power occurring at the outputs but without going into detail as to which explicit relationship exists between the total power and the cut-off frequencies.

The generally formulated relationship between the total power and the cut-off frequencies seems obvious.

Thus, document D1, abstract and D2, abstract disclose that in the case of two or more induction coils operated simultaneously, noise can occur as a result of the frequency difference between the switching frequencies. In addition, D1, paragraphs 18-25 and D2, column 1, line 65 to column 2, line 2 disclose that the power in the induction coils can be controlled with the aid of the frequency.

Consequently, it is deduced from each of said documents that a relationship exists between the power or the frequency on the one hand and the noise on the other hand and that at least two different frequencies and therefore also two different powers must always be present to produce the noise.

Finally, documents D1 and D2 therefore disclose that the total power which is composed of at least two powers determines the noise.

To determine the cut-off frequencies the person skilled in the art will certainly run through the frequency spectrum required for operation of the frequency converter circuit and therefore automatically also the power spectrum to determine the noise development and their the disturbing noise and will immediately determine the cut-off frequencies. Thus, claim 5 must not be inventive.

### **3.5 Claim 6**

Claim 6 does not satisfy the requirements of Article 33 (1) PCT because its subject matter does not appear to be based on an inventive step in the sense of Article 33(3).

Thus, the choice of parameters seems to have been selected from a limited number of possibilities where it is clear that these parameters are arrived at by routine testing or

application of normal development methods (PCT International Search and Preliminary Examination Guidelines, Chapter 13.14 (e) (ii)).

#### **4. Industrial applicability**

There are no objections to the industrial applicability of claims 1-6.